4 Alignment and Adjustments

This section of the service manual explains how to make permanent adjustments to the monitor. Direction is given for adjustment using the monitor Interface Board Ver. 2.0 and software (Softjig).

4-1 Adjustment Conditions

Caution: Changes made without the Softjig are saved only to the user mode settings. As such, the settings are not permanently stored and may be inadvertently deleted by the user.

4-1-1 Before Making Adjustments

4-1-1 (a) ORIENTATION

When servicing, always face the monitor to the east.

4-1-1 (b) MAGNETIC FIELDS

Whenever possible, use magnetic field isolation equipment such as a Helmholtz field to surround the monitor. If a Helmholtz field is not available, frequently degauss the unit under test.

Caution: Other electrical equipment may cause external magnetic fields which may interfere with monitor performance.

Use an external degaussing coil to limit magnetic build up on the monitor. If an external degaussing coil is not available, use the internal degaussing circuit. However, do not use the internal degaussing circuit more than once per 30 minutes.

4-1-1 (c) WARM-UP TIME

The monitor must be on for 30 minutes before starting alignment. Warm-up time is especially critical in color temperature and white balance adjustments.

4-1-1 (d) SIGNAL

Analog, 0.7 Vp-p positive at 75 ohm, internal termination
Sync: Separate/Composite
(TTL level negative/positive)

Sync-on-Green:
Composite sync 0.3 Vp-p negative
(Video 0.7 Vp-p positive)

4-1-1 (e) SCANNING FREQUENCY

Horizontal: 30 kHz to 115 kHz (Automatic)
Vertical: 50 Hz to 160 Hz (Automatic)

Unless otherwise specified, adjust at the 1024 x 768 mode (H: 68 kHz, V: 85 Hz) signals.

Refer to Table 2-1 on pages 2-2 and 2-3.

4-1-1 (f) HIGH VOLTAGE ADJUSTMENT

Signal: 1024 x 768 mode (68 kHz/85 Hz)
Display image: Full white
Contrast: Maximum
Brightness: Maximum
Limit: 27.3 kV ± 0.5 kV
(17": 26 kV ± 0.5 kV)

Measure the hight voltage level at the anode cap. High voltage should be within the limit as above. If the high voltage needs adjustment use the Softjig.

4-1-1 (g) G2 (SCREEN) VOLTAGE ADJUSTMENT

Signal: 1024 x 768 mode (68 kHz/85 Hz)
Display image: Full white
Contrast: Maximum
Brightness: Maximum

Adjust the Screen VR of the FBT so that the G2 (Screen) Voltage for Toshiba it is 540 V ± 10 V.

4-1-1 (h) CENTER RASTER

Adjust VR401 so that the back raster comes to the center when you apply a signal of 91 kHz/85 Hz.

PG17H*	SDD	TOSHIBA
G2	525V	635V

PG19S* PG19R*	MEC	SDD
G2	560V	530V

4-1-1 (i) BRIGHTNESS AND CONTRAST

Unless otherwise specified, adjust control volumes:

Brightness: Maximum
Contrast: Maximum

4-1-2 Required Equipment

The following equipment may be necessary for adjustment procedures:

4-1-2 (a) DISPLAY CONTROL ADJUSTMENT

1. Non-metallic (–) screwdriver: 1.5 mm
   Non-metallic (–) screwdriver: 3 mm
2. Philips (+) screwdriver: 1.5 mm
3. Non-metallic hexkey: 2.5 mm
4. Digital Multimeter (DMM), or
   Digital Voltmeter (DVM)
5. Signal generator, or
   Computer with a video board that uses the ET-4000 chipset (strongly recommended if using Samsung DM 200 software) and that displays: 1280 x 1024 @ 85 Hz, or 1600 x 1200 @ 85 Hz (maximum).
6. Personal computer
7. Required software: Softjig.exe from Samsung which includes the SF9839TE.MDL (Toshiba CRT) data file
   Samsung DM200, or DisplayMate for Windows from Sonera Technologies
8. Interface Board Ver. 2.0 Code No. BH81-90001K
9. Parallel communications cable (25-pin to 25-pin); Code No. BH81-90001H
10. Signal cable (15-pin to 15-pin cable with additional 3-pin connector); Code No. BH81-90001J
11. 5 V DC adapter, not supplied

Note: Softjig Ass'y (includes items 8, 9 and 10) Code No. BH81-90001L

4-1-2 (b) COLOR ADJUSTMENTS

1. All equipment listed in 4-1-2 (a), above
2. Color analyzer, or any luminance measurement equipmen

4-1-3 Connecting the SoftJig

Connect the monitor to the signal generator and/or PC as illustrated in Figures 4-1 and 4-2.

Note: The signal cable connector which includes the 3-wire cable must connect to the monitor. If you use Setup 2 (PC only, no signal generator) you can only make adjustments to the signal timing available on that computer system. To make corrections to all factory timings requires the use of an additional signal generator.

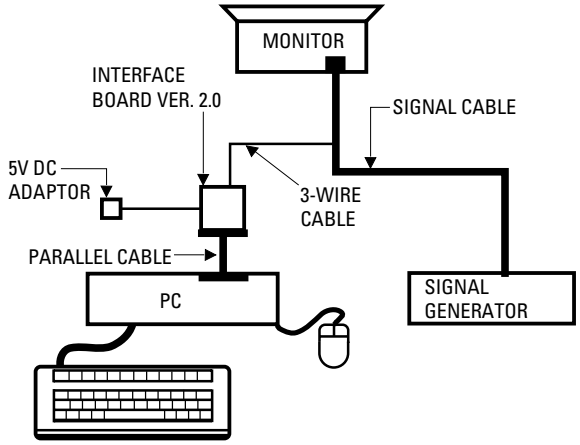

Figure 4-1. Setup 1, With Signal Generator

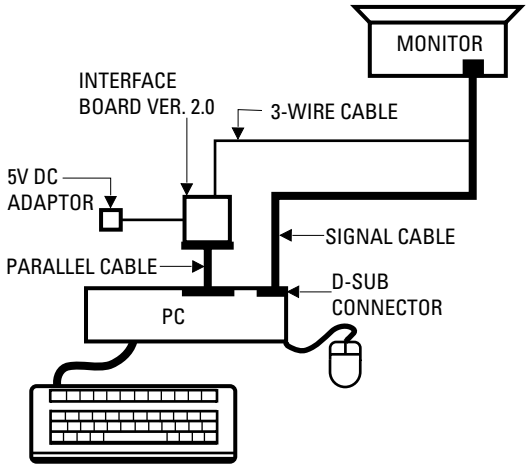

Figure 4-2. Setup 2, Without Signal Generator

4-1-4 After Making Adjustments

After finishing all adjustments, test the monitor in all directions. If, for example, the monitor does not meet adjustment specifications when facing north, reposition the monitor to face east and readjust. This time, try for an adjustment closer to the ideal setting within the tolerance range. Test the unit again in all directions. If the monitor again fails to meet specifications in every direction, contact your Regional After Service Center for possible CRT replacement.

4-2 Display Control Adjustments

4-2-1 Centering

Centering means to position the center point of the display in the middle of the display area. Horizontal size and position and vertical size and position control the centering of the display.

Adjust the horizontal size and vertical size to their optimal settings: 352 mm (H) x 264 mm (V).
1280 x 1024 mode (91 kHz/85Hz)

Adjust the horizontal position and vertical position to ≤ 4.0 mm of the center point of the screen.

| A-B | ≤ 4.0 mm. | C-D | ≤ 4.0 mm.

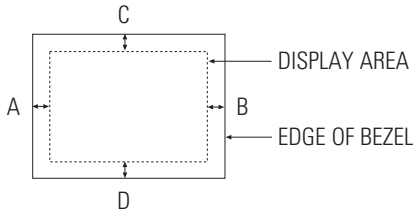

Figure 4-3. Centering

4-2-1 (a) HORIZONTAL SIZE ADJUSTMENT

CONDITIONS

Scanning frequency: 91 kHz/85 Hz
Display image: Crosshatch pattern
Brightness: Cut-off
Contrast: Maximum

Click on the << or >> box next to **H_SIZE** to adjust the horizontal size of the display pattern to 352 mm. (Tolerance: ± 3 mm.)

4-2-1 (b) VERTICAL SIZE ADJUSTMENT

CONDITIONS

Scanning frequency: 91 kHz/85 Hz
Display image: Crosshatch pattern
Brightness: Cut-off
Contrast: Maximum

Click on the << or >> box next to **V_SIZE** to adjust the vertical size of the display pattern to 264 mm. (Tolerance: ± 3 mm.)

4-2-1 (c) HORIZONTAL POSITION ADJUSTMENT

CONDITIONS

Scanning frequency: 91 kHz/85 Hz
Display image: Crosshatch pattern
Brightness: Cut-off
Contrast: Maximum

Click on the << or >> box next to **H_POSI** to center the horizontal image on the raster.

4-2-1 (d) VERTICAL POSITION ADJUSTMENT

CONDITIONS

Scanning frequency: 91 kHz/85 Hz
Display image: Crosshatch pattern
Brightness: Cut-off
Contrast: Maximum

Click on the << or >> box next to **V_POSI** to center the vertical image on the raster.

4-2-2 Linearity

Linearity affects the symmetry of images as they appear on the screen. Unless each row or column of blocks in a crosshatch pattern is of equal size, or within the tolerances shown in Tables 4-1 and 4-2, an image appears distorted, elongated or squashed.

Table 4-1. Factory Preset Modes Linearity

	Standard Modes Linearity	
	Each block (10 %)	Difference between adjacent blocks (4 %)
4 : 3	Horizontal: 20.9~23.1 Vertical : 20.9~23.1	Horizontal: Less than 0.88 mm Vertical : Less than 0.88 mm
5 : 4	Horizontal: 19.60~21.65 Vertical : 20.9~23.1	Horizontal: Less than 0.82 mm Vertical : Less than 0.88 mm

Table 4-2. Other Modes Linearity: VGA, SVGA, XGA, MAC, etc.

	Supported Timing Mode	
	Each block (14 %)	Difference between adjacent blocks (5 %)
4 : 3	Horizontal: 20.5~23.5 Vertical : 20.5~23.5	Horizontal: Less than 1.10 mm Vertical : Less than 1.10 mm
5 : 4	Horizontal: 19.18~22.07 Vertical : 20.5~23.5	Horizontal: Less than 1.03 mm Vertical : Less than 1.10 mm

4-2-2 (a) HORIZONTAL LINEARITY ADJUSTMENT

CONDITIONS

Scanning frequency: 91 kHz/85 Hz
Display image: Crosshatch pattern
Brightness: Cut-off
Contrast: Maximum

To adjust the Horizontal Linearity, refer to Tables 4-1 and 4-2 for the tolerance range.

Click on the << or >> box next to **H_LIN** to optimize the image.

4-2-2 (b) VERTICAL LINEARITY ADJUSTMENT

CONDITIONS

Scanning frequency:	91 kHz/85 Hz
Display image:	Crosshatch pattern
Brightness:	Cut-off
Contrast:	Maximum

To adjust the Vertical Linearity, refer to Tables 4-1 and 4-2 for the tolerance range.

Click on the << or >> box next to **V_LIN** to optimize the image.

4-2-3 Trapezoid Adjustment

CONDITIONS

Scanning frequency:	91 kHz/85 Hz
Display image:	Crosshatch pattern
Brightness:	Cut-off
Contrast:	Maximum

Click on the << or >> box next to **TRAP** to make the image area rectangular.

| A - B | < 5 mm

Figure 4-4. Trapezoid

4-2-4 Pinbalance Adjustment

CONDITIONS

Scanning frequency:	91 kHz/85 Hz
Display image:	Crosshatch pattern
Brightness:	Cut-off
Contrast:	Maximum

| D1 |, | D2 | ≤ 2.0 mm

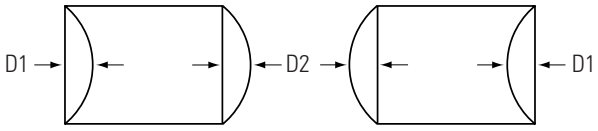

Figure 4-5. Pinbalance

Click on the << or >> box next to **PIN_BAL** to optimize the image.

4-2-5 Parallelogram Adjustment

CONDITIONS

Scanning Frequency:	91 kHz/85 Hz
Display image:	Crosshatch pattern
Brightness:	Cut-off
Contrast:	Maximum

Click on the << or >> box next to **PARALL** to make the image are rectangular.

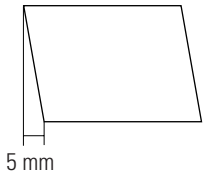

Figure 4-6. Parallelogram

4-2-6 Side Pincushion Adjustment

CONDITIONS

Scanning frequency:	91 kHz/85 Hz
Display image:	Crosshatch pattern
Brightness:	Cut-off
Contrast:	Maximum

Click on the << or >> box next to **BARREL** to straighten the sides of the image area.

| C1 |, | C2 | ≤ 2.0 mm, | D1 |, | D2 | ≤ 2.0 mm.

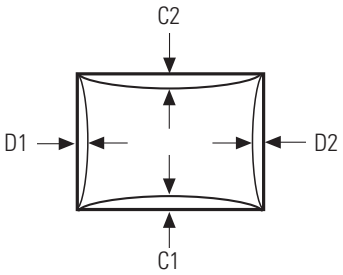

Figure 4-7. Pincushion

4-2-7 Tilt Adjustment

CONDITIONS

Scanning Frequency:	91 kHz/85 Hz
Display image:	Crosshatch pattern
Brightness:	Cut-off
Contrast:	Maximum

Click on the << or >> box next to **ROTATE** to correct the tilt of the display.

4-2-8 Degauss

No adjustments are available for the degaussing circuit. The degaussing circuit can effectively function only once per 30 minutes.

4-2-9 To Delete the User Mode Data

To delete the adjustment data from the user modes, Press the **MENU Button** for the 10 Seconds **.**

4-2-10 Save the Data

To save the adjustment data for a mode, press **FACTORY SAVE**.

4-3 Color Adjustments

4-3-1 Color Coordinates (Temperature)

Color temperature is a measurement of the radiant energy transmitted by a color. For computer monitors, the color temperature refers to the radiant energy transmitted by white. Color coordinates are the X and Y coordinates on the chromaticity diagram of wavelengths for the visible spectrum.

CONDITIONS

Measurement instrument:	Color analyzer
Scanning frequency:	68 kHz/85 Hz
Display Size :	352 (H) x 264 (V)
Display image:	White flat field at center of display area
Brightness:	Cut-off
Contrast:	Maximum

PROCEDURE

Use the directions in sections 4-3-2 through 4-3-4 to adjust the color coordinates for:
9300K to x = 0.283 ± 0.02, y = 0.298 ± 0.02
6500K to x = 0.313 ± 0.02, y = 0.329 ± 0.02
5000K to x = 0.346 ± 0.02, y = 0.359 ± 0.02

4-3-2 Color Adjustments for 9300K

4-3-2 (a) BACK RASTER COLOR ADJUSTMENT

CONDITIONS

Scanning frequency:	68 kHz/85 Hz
Display image:	Back raster pattern
Brightness:	Cut-off
Contrast:	Maximum

1. Select **COLOR CHANNEL 1** to control the color for 9300K.
2. Adjust the luminance of the back raster to between 0.3 to 1ft-L using the **G_CUT** controls.
3. Click on the << or >> box next to **B_CUT** to set the "y" coordinate to 0.298 ± 0.02.
4. Click on the << or >> box next to **R_CUT** to set the "x" coordinate to 0.283 ± 0.02.

   Note: If the above adjustments cannot be done to each coordinate, click on the << or >> box next to **G_CUT** to decrease or increase the green cutoff (bias) and repeat procedures 2 and 3.

4-3-2 (b) G-GAIN ADJUSTMENT

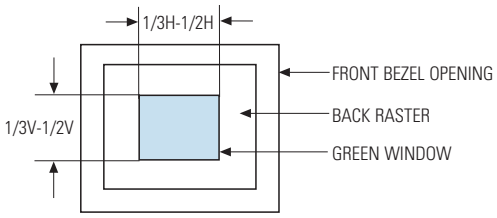

Figure 4-8. Green Box Pattern

CONDITIONS

Scanning frequency:	68 kHz/85 Hz
Display image:	Green box pattern
Brightness:	Cut-off
Contrast:	Maximum

1. Click on the << or >> box next to **G_GAIN** to adjust the brightness of the Green Gain to 25 ± 1 ft-L.

   Note: If you can't increase the Green Gain to the appropriate value, click on the >> box next to increase the **ABL** point.

4-3-2 (c) WHITE BALANCE ADJUSTMENT

CONDITIONS

Scanning frequency:	68 kHz/85 Hz
Display image:	Full white pattern
Brightness:	Cut-off
Contrast:	Maximum

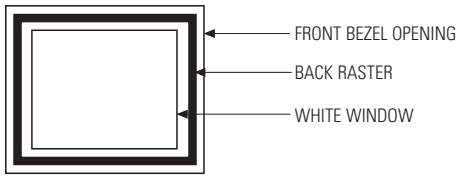

Figure 4-9. Full White Pattern

1. Click on the << or >> boxes next to **R_GAIN** and **B_GAIN** to make the video white. (For 9300K color adjustment: x = 0.283 ± 0.02, y = 0.298 ± 0.02.)

   Note: Do not touch the **G_GAIN** controls.
2. Check the ABL. If it is not within the specifications (30 ± 1 ft-L), use the ABL controls to adjust it.
3. Select **COLOR FACTORY SAVE** to save the data.

4-3-2 (d) WHITE BALANCE ADJUSTMENT VERIFICATION

CONDITIONS

Scanning frequency:	68 kHz/85 Hz
Display image:	Back raster pattern
X-Y Coordinates:	x = 0.283 ± 0.02, y = 0.298 ± 0.02
Raster Luminance	0.3 ~ 1ft-L
ABL Luminance	30 ± 1 ft-L
Brightness:	Cut-off
Contrast:	Maximum

1. Check whether the color coordinates of the back raster satisfy the above spec.

   If they do not, return to 4-3-2 (a) and readjust all settings.
2. Display a full white pattern.

Note: Do not touch the **G_GAIN** controls.

3. Adjust the Contrast Control on the monitor so that the luminance of the video is about 5 ft-L.
4. Check whether the white coordinates of the video meet the above coordinates spec.
5. Adjust the Contrast Control again so that the luminance of the video is about 20 ft-L.
6. Check whether the white coordinates of the video satisfies the above spec.

   If they do not, return to 4-3-2 (a) and readjust all settings.

4-3-3 Color Adjustments for 6500K

4-3-3 (a) BACK RASTER COLOR ADJUSTMENT

CONDITIONS

Scanning frequency:	68 kHz/85 Hz
Display image:	Back raster pattern
Brightness:	Cut-off
Contrast:	Maximum

1. Select **COLOR CHANNEL 2** to control the color for 6500K.
2. Adjust the luminance of the back raster to between 0.3 to 1.0 ft-L using the **G_CUT** controls.
3. Click on the << or >> boxes next to **R_CUT** and **B_CUT** to adjust the R-Bias to x = 0.313 ± 0.02 and the B-Bias to y = 0.329 ± 0.02.

4-3-3 (b) G-GAIN ADJUSTMENT

This procedure is the same as that for 9300K, refer to the procedure on page 4-5.

4-3-3 (c) WHITE BALANCE ADJUSTMENT

CONDITIONS

Scanning frequency:	68 kHz/85 Hz
Display image:	Full white pattern
Brightness:	Cut-off
Contrast:	Maximum

1. Click on the << or >> boxes next to **R_GAIN** and **B_GAIN** to make the video white. (For 6500K color adjustment: x = 0.313 ± 0.02, y = 0.329 ± 0.02.)
2. Refer to the procedure for 9300K, section 4-3-2 (c) steps 2 and 3.

4-3-3 (d) WHITE BALANCE ADJUSTMENT VERIFICATION

Refer to the procedure for 9300K, section 4-3-2 (d).

4-3-4 Color Adjustments for 5000K

4-3-4 (a) BACK RASTER COLOR ADJUSTMENT

CONDITIONS

Scanning frequency:	68 kHz/85 Hz
Display image:	Back raster pattern
Brightness:	Cut-off
Contrast:	Maximum

1. Select **COLOR CHANNEL 3** to control the color for 5000K.
2. Adjust the luminance of the back raster to between 0.3 to 1.0 ft-L using the **G_CUT** controls.
3. Click on the << or >> boxes next to **R_CUT** and **B_CUT** to adjust the R-Bias to x = 0.346 ± 0.02 and the B-Bias to y = 0.359 ± 0.02.

4-3-4 (b) G-GAIN ADJUSTMENT

This procedure is the same as that for 9300K, refer to the procedure on page 4-5.

Adjust the brightness of the **G_GAIN** less 5 ft-L than brightness of procedure for 9300K.

4-3-4 (c) WHITE BALANCE ADJUSTMENT

CONDITIONS

Scanning frequency:	68 kHz/85 Hz
Display image:	Full white pattern
Brightness:	Cut-off
Contrast:	Maximum

1. Click on the << or >> boxes next to **R_GAIN** and **B_GAIN** to make the video white. (For 5000K color adjustment: x = 0.346 ± 0.02, y = 0.359 ± 0.02.)
2. Refer to the procedure for 9300K, section 4-3-2 (c) steps 2 and 3.

4-3-4 (d) WHITE BALANCE ADJUSTMENT VERIFICATION

Refer to the procedure for 9300K, section 4-3-2 (d).

4-3-5 Luminance Uniformity Check

Luminance is considered uniform only if the ratio of lowest to highest brightness areas on the screen is not less than 7.5:10.

CONDITIONS

Scanning frequency:	68 kHz/85 Hz (1024 x 768)
Display image:	White flat field
Display size	352 (H) x 264 (V)
Brightness:	Cut off point
Contrast:	Maximum

PROCEDURE

Measure luminance at nine points on the display screen (see figure below).

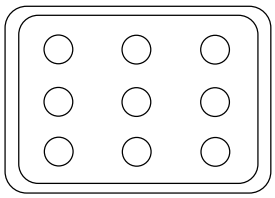

Figure 4-10 Luminance Uniformity Check Locations

4-3-6 Focus Adjustment

CONDITIONS

Scanning frequency:	68 kHz/85 Hz
Display image:	"H" character pattern
Brightness:	Cut off point
Contrast:	Maximum

PROCEDURE

1. Adjust the Focus VR on the FBT to display the sharpest image possible.
2. Use Locktite to seal the Focus VR in position.

4-3-7 Color Purity Adjustment

Color purity is the absence of undesired color. Conspicuous mislanding (unexpected color in a uniform field) within the display area shall not be visible at a distance of 50 cm from the CRT surface.

CONDITIONS

Orientation:	Monitor facing east
Scanning frequency:	68 kHz/85 Hz
Display image:	White flat field
Luminance:	Cut off point at the center of the display area

Note: Color purity adjustments should only be attempted by qualified personnel.

PROCEDURE

For trained and experienced service technicians only.

Use the following procedure to correct minor color purity problems:

1. Make sure the display is not affected by external magnetic fields.
2. Very carefully break the glue seal between the 2-pole purity convergence magnets (PCM), the band and the spacer.
3. Make sure the spacing between the PCM assembly and the CRT stem is 29 mm ± 1 mm.
4. Display a green pattern over the entire display area.
5. Adjust the purity magnet rings on the PCM assembly to display a pure green pattern. (Optimum setting: x = 0.295 ± 0.015, y = 0.594 ± 0.015)
6. Repeat steps 4 and 5 using a red pattern and then again, using a blue pattern.

Table 4-3. Color Purity Tolerances

Red:	x = 0.620 ± 0.015	y = 0.334 ± 0.015
Green:	x = 0.289 ± 0.015	y = 0.595 ± 0.015
Blue:	x = 0.153 ± 0.015	y = 0.072 ± 0.015

(For 9300K color adjustment: x = 0.283 ± 0.02, y = 0.298 ± 0.02)

7. When you have the PCMs properly adjusted, carefully glue them together to prevent their movement during shipping.

Memo